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Enhancing Arabic Vocabulary Learning through Fill-in-the-Blank Sentence Puzzles: Evidence from a Quasi-Experimental Study on Retention and Learner Engagement

باستخدام ألغاز الجمل الناقصة: دراسة شبه تجريبية حول الاحتفاظ بالمفردات ودافعية المتعلمين

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ABSTRACT

Vocabulary mastery is essential in language learning, particularly in Arabic, which features complex morphological and syntactic structures. However, vocabulary instruction ofte relies on memorization, limiting meaningful and sustained acquisition. This study examines the effectiveness of fill-in-the-blank sentence puzzles as a contextual instructional strategy to enhance vocabulary learning, retention, and learner engagement. A quasi-experimental design with a non equivalent control group was employed, involving 50 junior secondary students (25 experimental, 25 control). Data were collected through pretest, posttest, delayed posttest, an a motivation questionnaire. Quantitative data were analyzed using t-test and effect size calculations. The results show that the experimental group significantly outperformed the control group in both immediate learning ($t(48) = 7.85$, $p < 0.001$) and retention ($t(48) = 6,92$, $p < 0.001$). The experimental group also achieved higher retention (93.44% vs. 90.63%) and engagement (M = 88 vs. 72). These findings indicate that contextual puzzle-based tasks promote deeper cognitive processing and more durable vocabulary acquisition. This study provides emperical support for contextua; and task-based vocabulary learning and offers a practical, low-resource strategy for enhancing Arabic vocabulary instruction.

Keywords: Arabic Vocabulary Learning; Contextual Learning; Fill-in-the-Blank Puzzles; Learner Engagement; Vocabulary Retention

مستخلص البحث

تُعدّ المفردات عنصرًا أساسيًا في تعلّم اللغة، ولا سيما اللغة العربية التي تتميّز بتعقيدها الصرفي و النحوي. ومع ذلك، لا تزال طرق التدريس تعتمد على الحفظ، مما يحدّ من اكتساب المفرد بشكل فعّال ومستدام. تهدف هذه الدراسة إلى فحص فاعلية ألغاز الجمل الناقصة كاستراتيجية تعليمية سياقية لتعزيز تعلّم المفردات، والاحتفاظ بها، وزيادة دافعية المتعلمين. اعتمدت الدراسة تصميمًا شبه تجريبي بمجموعتين (تجريبية وضابطة) بلغ عدد المشاركين فيهما ٥٠ طالبًا. جُمعت البيانات من خلال اختبارات قبلية وبعدية ومؤجّلة، إضافة إلى استبانة دافعية. تم تحليل البيانات باستخدام اختبار **(t)** وحجم الأثر. أظهرت النتائج تفوق المجموعة التجريبية في التحصيل الفوري **($t(48)=7.85$, $p<0.001$)** والاحتفاظ **($t(48)=6.92$, $p<0.001$)** ، مع معدل احتفاظ أعلى (٩٣,٤٤٪ مقابل ٩٠,٦٣٪) ومستوى دافعية أكبر (٨٨ مقابل ٧٢). وتشير النتائج إلى أن التعلّم السياقي القائم على المهام يعزّز المعالجة المعرفية العميقة واكتساب المفردات بشكل أكثر استدامة. تقدّم الدراسة دليلًا تجريبيًا على فاعلية التعلّم السياقي، وتقترح استراتيجية تعليمية عملية ومنخفضة التكلفة لتحسين تدريس المفردات العربية.

الكلمات المفتاحية: تعلّم المفردات العربية؛ التعلّم السياقي؛ ألغاز الجمل الناقصة؛ الاحتفاظ بالمفردات؛ دافعية المتعلم

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INTRODUCTION

Vocabulary mastery is widely recognized as a fundamental component of language proficiency (Ha 2021). It underpins the development of the four core language skills: listening, speaking, reading, and writing. However, previous research has consistently shown that insufficient vocabulary knowledge remains a major barrier for learners in both receptive and productive language use, particularly in academic contexts where lexical precision is required (de Jong et al. 2012). In Arabic language learning, this challenge becomes more pronounced due to its complex morphological syatem (*ṣarf*) and syntactic structure (*naḥw*), which differ significantly from the learners' first language (Djuaeni and Usman 2021). These linguistic characteristics suggest that vocabulary learning cannot be reduced to memorization alone, but must involve contextualized and structurally integrated knowledge of word usage.

Despite this theoretical understanding, a critical review of classroom practice and empirical studies reveals a persistent dominance of form-focused and rote memorization approaches in Arabic vocabulary instruction. While such approaches may support short-term recall, a growing body of research indicates that they are often insufficient for promoting long-term retention and accurate lexical deployment in communication contexts (Hanani, Ahid, and Sufirmansyah 2024; Pisal et al. 2024). However, the literature is not consistent in this regard. Some studies report that repetition based strategies can still yield moderate gains in vocabulary recognition under controlled conditions, particularly when combined with structured exposure (Duong 2025), suggesting that the effectiveness of vocabulary instruction may depend on task design rather than memorization alone.

In response to these limitations, contextualized vocabulary learning has emerged as a promising pedagogical direction. Studies in second language acquisition generally agree that vocabulary learned within meaningful contexts is retained more effectively and retrieved more accurately than vocabulary learned in isolation. Nevertheless, there is still disagreement regarding which types of contextual tasks are most effective. Some researchers emphasize sentence-based inference tasks, while others highlight interactive or game based environments as more motivating but not necessarily more cognitively demanding (Abdel-Ghany Al-Sabbagh 2023; Anane 2024; Cheng, Lu, and Xiao 2025). This divergence suggests that engagement alone does not guarantee deep lexical processing, and that task design plays a critical mediating role.

Within the field of game based language learning, various vocabulary-focused intervetions have been investiged, including crossword puzzles (Maskanah et al. 2023), word-matching games (Hayati, Nofrita, and Syahrul 2021), hangman games (Wijaya, Murdiono, and Sarimov 2023), digital quizzes (Nuci et al. 2021), and interactive quiz platforms (Resmayani, Ade, and Widaswara 2022). Collectively, these

studies suggest that game based learning environments enhance motivation and participation. However, a critical synthesis of their findings reveals an important limitation: most of these studies prioritize lexical recognition and form matching rather than contextualized production. In other word, learners are often trained to identity correct answers rather than to actively construct meaning within sentence structures. This raises an unresolved pedagogical issue regarding whether increased engagement necessarily translates into improved syntactic accuracy and long-term retention.

One instructional approach that may address this gap is the fill-in-the-blank sentence puzzle (*imlāʾ al-farāgh*), which requires learners to complete incomplete sentences by selecting and inserting appropriate vocabulary items. Unlike matching based games, this task demands simultaneous activation of lexical knowledge, syntactic awareness, and contextual interpretation. From a cognitive perspective, such task are likely to promote deeper processing, which is strongly associated with long term retention and transfer of knowledge (Marrese-Taylor et al., 2018). Empirical evidence from broader SLA contexts also supports the view that vocabulary learned through sentence integration is more durable and usable in communication (Hoorul Firthouz 2024; Rasti-Behbahani and Shahbazi 2022). However, most of these findings are derived from from English or other widely studied language, leaving Arabic as an underexplored context.

A further gap emerges when examining Arabic vocabulary research specifically. Existing stuides on Arabic language learning have predominantly focused on gamification strategies aimed at increasing learner motivation and classroom engagement, such as digital games and word based puzzles (Akla and Handayana 2022; Ghani and Daud 2023; Wan Daud 2024). While these studies contribute to understanding motivational aspects of learning, they rarely investigate how such interventions affect deeper cognitive outcomes such as retention over time and accurate lexical use in sentence level context. Morever, longitudinal evidence assessing delayed retention remains particularly limited in Arabic vocabulary pedagogy, indicating a methodological gap in the literature.

Taken together, these inconsistencies and limitations highlight the need for further investigation into instructional designs that integrate contextual sentence processing with vocabulary learning tasks. In particular, there is a lack of empirical evidence on whether fill-in-the-blank sentence puzzles can effectively bridge the gap between engagement-oriented gamification and cognitively demanding contextual vocabulary acquisition. Addressing this gap is important not only for improving classroom practice but also for strengthening theoretical understanding of how task-based design influences lexical development.

Therefore, the novelty of this study lies in its investigation of fill-in-the-blank sentence puzzles in Arabic vocabulary learning with a focus on three interconnected dimensions: (1) vocabulary retention over time, (2) accuracy of lexical usage within sentence contexts, and (3) the cognitive effect of forced-response puzzle design (i.e., absence of answer choices) in promoting deeper processing and learning engagement. By integrating these dimensions, this study positions itself within the broader

international discourse on contextual vocabulary acquisition and task-based language learning.

Based on this background, the research addresses the following questions: (1) To what extent are fill-in-the-blank puzzles effective in improving students' Arabic vocabulary mastery?; (2) How does sentence context in fill-in-the-blank activities influence students' accuracy in using vocabulary within Arabic sentences?; (3) Does the use of fill-in-the-blank puzzles contribute to stronger vocabulary retention compared to conventional memorization-based approaches?

By addressing these questions, this study contributes both theoretically and practically. Theoretically, it extends current models of contextual vocabulary acquisition by incorporating evidence from Arabic as a less-represented language context. Practically, it offers pedagogical implications for Arabic language teachers by proposing a task design that integrates engagement, contextual processing, and long-term retention in vocabulary instruction.

RESEARCH METHOD

This study employed a quasi-experimental design with a non equivalent control group to examine the effectiveness of fill-in-the-blank sentence puzzles in improving students' Arabic vocabulary mastery. Two intact classes were involved in the study: one served as the experimental group and the other as the control group. Both groups were administrated a pretest and a posttest to measure changes in vocabulary mastery before and after the instructional intervention. This design allows for comarison between groups while maintaining the natural classroom setting, which is commonly applied in educational research where randam assignment is not feasible (Creswell and Creswell 2018).

The participants of this study were 50 eight-grade students at Madrasah Swasta Darul Qiyam-Islamic Boarding School, Kerinci Regency, Indonesia. The population consisted of all students enrolled in Grade VIII who were studying Arabic as a compulsory subject. The sample was selected using purposive sampling, involving two intact classes: one class was assigned as the experimental group and the other as the control group, with 25 students in each group. The selection was based on the similarity of students` initial Arabic proficiency, as indicated by the results of the school`s placement test. This sampling technique was chosen to ensure that the participants possessed relevant characteristics aligned with the research objectives (Campbell et al. 2020; Willie 2024). Prior to data collection, permission was obtained from the school authorities, and ethical considerations such as confidentiality and voluntary participation were strictly maintained throughout the research process.

The study involved two main variables. The independent variable was the use of fill-in-the-blank sentence puzzles as an instructional strategy, while the dependent variable was students` Arabic vocabulary mastery (Flannelly, Flannelly, and Jankowski 2014). Vocabulary mastery was operationalized into two dimensions: (1) vocabulary retention, reffering to students` ability to recall previously learned vocabulary over time, and (2) contextual accuracy, referring to students` ability to use vocabulary appropriately within sentence structures. These operational definitions

were used to guide the development of research instruments and ensure construct clarity (Garcés-Manzanera 2023; Mulder, Ven, and Verhoeven 2019).

Data were collected using multiple instruments, including vocabulary tests, questionnaires, and observation sheets to enhance the validity and comprehensiveness of the data (Zhang and Aryadoust 2022). The vocabulary test consisted of sentence-based items requiring students to complete incomplete sentences using appropriate Arabic vocabulary. This format was selected because it measures both lexical knowledge and contextual understanding. The test was administrated as a pretest and post test to both groups.

The questionnaire was designed to examine students` perceptions and engagement toward the use of fill-in-the-blank puzzles, while observation sheets were used to document students' participation and classroom interaction during the learning process.

The validity of the instruments was established through expert judgment involving two experts in Arabic language and one expert in educational assessment (Chou 2024; Gu 2018; Zhang and Aryadoust 2022). The experts evaluated the instruments in terms of content relevance, linguistic accuracy, clarity instructions, and alignment with learning objectives. Based on their feedback, several revisions were made to improve the quality of the test items before implementaion. In addition, the reability of the vocabulary test was measured using Cronbach's Alpha, indicating acceptable internal consistency (Hayes and Coutts 2020; Taber 2018).

The research procedure consisted of three main stages: preparation, implementation, and evaluation. During the preparation stage, instructional materials and worksheets based on fill-in-the-blank sentence puzzles were developed following instructional design principles (Branch 2009).

In the implementation stage, the experimental group received treatment using on fill-in-the-blank sentence puzzles, while the control group was taught using conventional vocabulary learning methods such as memorization and translation exercises. The intervention was conducted over six meetings, with each session lasting approximately 90 minutes, ensuring sufficient exposure and practice for vocabulary acquisition (Macalister and Nation 2019). The instructional activities in the experimental group emphasized contextual sentence completion tasks that required active cognitive processing.

In the evaluation stage, both groups were administrated a posttest, and additional data were collected through questionnaires and classroom observations to capture students` responses and engagement.

The data were analyzed using both quantitative and qualitative approaches.. Quantitative data from the pretest and posttest scores were analyzed using an independent samples t-test and paired samples t-test to examine both within group and between group differences. These statistical tests were used to determine wheter the instructional intervention had a significant effect on students` vocabulary mastery (Field 2009; Kim 2015).

Descriptive statistics were used to analyze questionnaire data, while observational data were analyzed qualitatively through data reduction, data display, and conclusion drawing (Lungu 2022; Miles, et al., 2014). The integration of quantitative and qualitative findings privided a more comprehensive understanding

of the effectiveness of fill-in-the-blank puzzles in Arabic vocabulary learning (Fetters and Molina-Azorin 2020).

RESULT AND DISCUSSION

Results

Descriptive Analysis of Pretest and Posttest Scores

The first analysis examined differences in vocabulary mastery between the experimental and control groups before and after the instructional treatment. The experimental group received learning activities using fill-in-the-blank puzzles, while the control group learned vocabulary through conventional methods based on letter puzzles and memorization. Table 1 presents the descriptive statistics of students' vocabulary test scores in both groups.

Table 1.
Descriptive Statistics of Pretest and Posttest Scores

Group	N	Pretest Mean (SD)	Posttest Mean (SD)	Gain Score
Experimental	25	12.8 (3.2)	24.4 (2.1)	11.6
Control	25	13.0 (2.9)	19.2 (2.7)	6.2

The results show that both groups experienced improvements in vocabulary scores after the learning intervention. However, the increase in the experimental group was substantially higher than that of the control group. The experimental group achieved a mean gain score of 11.6, while the control group achieved a gain score of 6.2.

The pretest scores of both groups were relatively similar, indicating comparable intial vocabulary abilities prior to the intervention. This suggests that the observed differences in posttest scores are associated with the instructional treatment.

The difference in gain scores between the experimental and control groups indicates a stronger improvement in vocabulary mastery in the experimental group. Although both groups showed progress, the magnitude of improvement was higher in the group that received the fill-in-the-blank sentence puzzle treatment.

Long-Term Vocabulary Retention

In addition to measuring immediate learning outcomes, this study also examined students' long-term vocabulary retention through a delayed posttest conducted four weeks after the intervention. The purpose of this test was to determine whether the vocabulary learned during the instructional treatment could be retained over a longer period. The results of the delayed posttest are presented in Table 2.

Table 2.
Delayed Posttest Scores (Long-Term Retention)

Group	N	Delayed Posttest Mean (SD)
Experimental	25	22.8 (2.4)

Group	N	Delayed Posttest Mean (SD)
Control	25	17.4 (2.9)

The results show that the experimental group achieved a higher mean score than the control group in the delayed posttest. Both groups showed a decrease compared to the immediate posttest scores, with a smaller reduction observed in the experimental group.

To provide a clearer understanding of vocabulary retention, a retention rate was calculated by comparing the delayed posttest scores with the posttest scores for each group. The retention rate was computed using the formula: retention rate = (delayed posttest mean / posttest mean) × 100%.

Based on this calculation, the experimental group, with a posttest mean of 24.4 and a delayed posttest mean of 22.8, achieved a retention rate of 93.44%. Meanwhile, the control group, with a posttest mean of 19.2 and a delayed posttest mean of 17.4, achieved a retention rate of 90.63%.

Effect Size

Effect size was calculated using Cohen's d to determine the magnitude of the instructional effect. The result indicates that the experimental group showed a very large effect from pretest to posttest (d = 4.29), while the control group showed a large effect (d = 2.21). in addition, the between-group comparison at the posttest stage yielded a very large efeect size (d = 2.15).

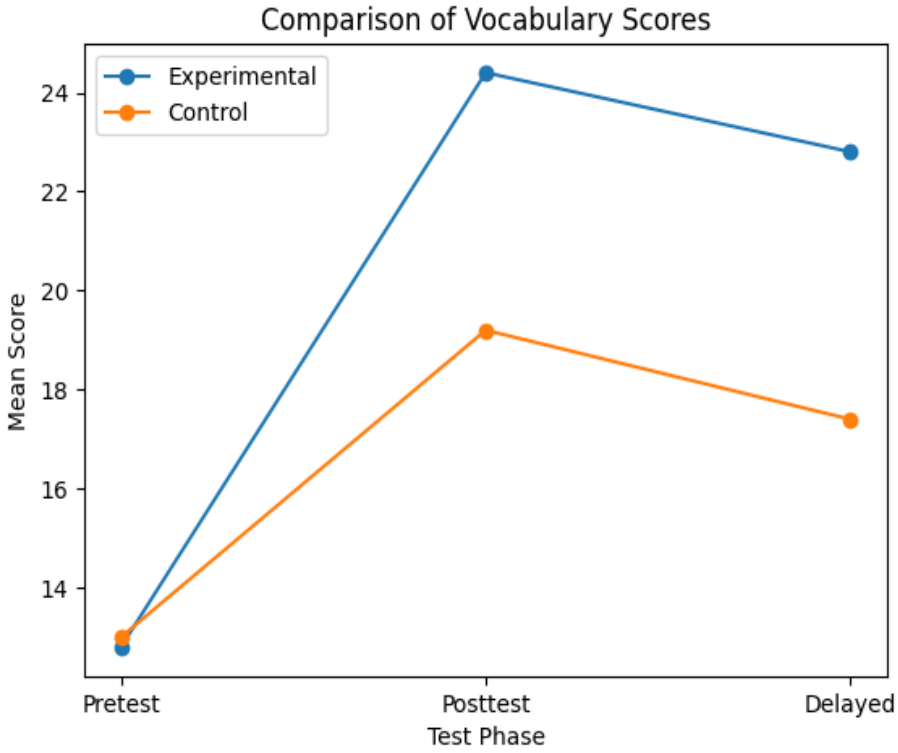
The result demonstrate that the magnitude of improvement in the experimental group was substantially greater than that of the control group.

A comparison of pretest, posttest, and delayed posttest scores shows that the experimental group experienced a sharp increase from pretest to posttest, followed by a relatively small decrease at the delayed posttest stage. In contrast, the control group showed a smaller increase and a more noticeable decline over time.

The delayed posttest results further indicate that the experimental group maintained a higher mean score compared to the control group. Although both groups experienced a decrease after the posttest, the reduction in the experimental group was smaller.

Overall, the combination of gain scores, retention rates, and effect size values indicates a stronger improvement pattern in the experimental group compared to the control group across all measurement points.

Figure 1 presents a graphical comparison of mean vocabulary scores across the pretest, posttest, and delayed posttest for both groups



Inferential Anaysis

Prior to conducting hypothesis testing, the data were examined for normality and homogeneity to ensure the appropriateness of parametric statistical analysis. The Shapiro–Wilk test indicated that the data from both groups were normally distributed ($p > 0.05$), while the Levene's test confirmed the homogeneity of variance between groups ($p > 0.05$). These results indicate that the assumptions for conducting an independent sample t-test were met.

The result of the independent samples *t*-test revealed a statically significant difference between the experimental and control groups. For the posttest scores, a significant difference was found, $t\ (48) = 7.85$, $p < 0.001$. Similarly, the delayed posttest scores also showed a significant difference, $t(48) = 6.92$, $p < 0.001$.

The results indicae that the experimental group outperformed the control group in both immediate and delayed measurements. The magnitude of the *t*-values and significance levels ($p < 0.001$) suggest that the observed differences between groups were statiscally significant.

In addition to statistical significance, the results are supported by effect size and retention analyses, which show consistent patterns of higher improvement and retention in the experimental group compared to the control group.

Students' Motivation and Engagement

To complement the quantitative findings, this study also examined students' motivation and engagement through a questionnaire administered after the instructional treatment.

The results show that the experimental group achieved an average motivation score of 88 out of 100, categorized as "very positive," while the control group obtained an average score of 72, categorized as "positive." Table 3 summarizes the motivation and engagement scores of both groups.

Table 3. Students` Motivation and Engagement Scores

Group	N	Mean Score	Category
Experimental	25	88	Very Positive
Control	25	72	Positive

These results indicate that the experimental group demonstrated higher levels of motivation and engagement compared to the control group.

In addition to the quantitative data, qualitative responses from students indicated that the learning activities were perceived as enjoyable, engaging, and different from conventional memorization-based approaches.

Overall, the findings show a consistent pattern in which the experimental group exhibited higher motivation and engagement levels than the control group.

Discussion

The findings of this study demonstrate that the use of fill-in-the-blank sentence puzzles leads to significantly higher improvements in students' Arabic vocabulary mastery compared to conventional instructional methods. The experimental group outperformed the control group not only in immediate posttest scores but also in delayed postetst performance, indicating both short-term learning gains and sustained retention. These results suggest that the effectiveness of vocabulary instruction is strongly influenced by the nature of the learning tasks, particularly the extent to which the promote contextual processing and active learner engagement.

From a theoretical perspective, these finding reinforce the principle of contextualized vocabulary acquisition, which posits that vocabulary is more effectively learned when embedded in meaningful linguistic context. As argued by Eskandari et al. (2024), vocabulary knowledge involves not only form-meaning mapping but also the ability to use words appropriately within syntactic and communicative context. The present study extends this perspective by providing empirical evidence that sentence-based puzzle tasks can operationalize contextual learning in a structured and pedagogically feasible manner. Unlike traditional memorization approaches, the fill-in-the-blank sentences puzzles required learners to integrate lexical knowledge with grammatical awareness, thereby promoting deeper lexical processing.

However, the findings also contribute to ongoing debates in vocabulary pedagogy regarding the role of engagement versus cognitive depth. While previous studies in game-based learning have emphasized increased motivation and participation (Zou, Huang, and Xie 2021), they often do not sufficiently address whether such engagement translates into durable learning outcomes. The present study suggests that engagement alone is not sufficient; rather, it is the combination of engagement and cognitively demanding tasks that leads to optimal learning. In this case, the absence of answer choices in the puzzle design appears to play a crucial role in encouraging learners to actively retrieve and evaluate vocabulary items, thereby strengthening memory retention.

The delayed posttest results further highlight the importance of depth of processing in vocabulary learning. The experimental group demonstrated more stable retention over a four-week period, which aligns with cognitive theories suggesting that deeper semantic processing leads to more durable memory traces. According to Duong (2025), tasks that require learners to analyze contextual meaning and make lexical decisions promote stronger retention compared to surface-level repetition. The findings of this support this claim by showing that learners who engaged in sentence completion tasks retained vocabulary more effectively than those who relied on memorization-based strategies.

In addition to cognitive factors, the study also reveals the significant role of affective engagement in supporting vocabulary acquisation. The higher motivation and engagement scores observed in the experimental group indicate that the puzzle-based approach created a more stimulating and interactive learning environment. This finding is consistent with theories of game-based learning, which emphasize the role of challenge, curiosity, and active participation in enhancing learning experiences. More importantly, the results suggest that effective engagement and cognitive processing are not separate dimensions but mutually reinforcing components of effective instruction.

The comparison between the experimental and control group also provides important pedagogical insights. Although the control group showed some improvement, their gains were significantly lower, indicating that conventional methods such as memorization and letter-based puzzles may be insufficient for developing contextual vocabulary knowledge. This supports Folse (2006) argument that shallow processing strategies tend to result in limited retention and restricted language use. In contrast, the fill-in the-blank puzzle strategy facilitates the integration of vocabulary knowledge with sentence structure, thereby enhancing both accuracy and usability of lexical items.

From a broader perspective, this study contributes to the field of second language acquisition by addressing a gap in Arabic vocabulary pedagogy, which has been relatively underexplored in empirical research. While much of the existing literature focuses on widely studied langauge such as English, the present findings demonstrate that principles of contextual and task-based learning are equally applicable and effective in the context of Arabic language instruction. This highlights the potential for adapting general SLA theories to less-represented langauge contexts.

Despite these contribution, several limitations should be acknowledged. The study was conducted over a relatively short instructional period, which may limit the generalizability of the findings over longer learning durations. Additionally, the sample was restricted to a single educational institution, which may effect the external validity of results. Future research in therefore recommended to employed longitudinal designs and involve more diverse participant groups to further examine the sustainability and generalizability of the findings.

CONCLUSION

This study confirms that the use of fill-in-the-blank sentence puzzles is an effective instructional strategy for enhancing students' Arabic vocabulary mastery. Students in the experimental group demonstrated significantly higher gains in

vocabulary performance compared to those in the control group, indicating that contextual sentence-based learning facilitates deeper understanding and more accurate use of vocabulary within Arabic linguistic structures. These findings directly address the research questions by showing that contextual puzzle-based tasks not only improve vocabulary acquisition but also enhance learners` ability to apply vocabulary meaningfully in sentence contexts.

Furthermore, the results reveal that the instructional strategy contributes to stronger long-term retention. The experimental group maintained higher performance in the delayed posttest, suggesting that learning activities involving active retrieval and contextual processing promote more durable memory traces. This highlights the importance of integrating cognitively demanding tasks into vocabulary instruction to support sustained learning outcomes.

In addition to cognitive gains, the study also demonstrates that fill-in-the-blank puzzles positively influence students' motivation and engagement. The interactive and problem-solving nature of the tasks encourages active participantion., indicating that effective vocabulary instruction should balance both cognitive depth and affective involvement.

From a theoretical perspective, this study contributes to the field of Arabic vocabulary pedagogy by providing empirical support for the effectiveness of contextualized vocabulary acquisition and task-based learning. It extends existing research by demonstrating that structured sentence-based puzzle task can operationalize deep lexical processing in less-explored language context, namely Arabic.

Practically, the findings offers important implications for language teaching. Arabic language teachers are encouraged to move beyond memorization-based approaches and incorporate context-rich, task-oriented activities such as fill-in-the-blank puzzles to enhance vocabulary learning, retention, and student engagement. These strategies are particularly valuable in classroom settings with limited access to digital learning tools, as they are low-cost yet pedagogically effective.

Despite these contributions, this study is limited by its relatively short duration and its focus on a single institutional context. Future research is recommended to examine the long-term sustainability and broader applicability of the findings.

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